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PATENT & TRADEMARK OFFICE

Docket 86669RLO
Customer No. 01333

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	Group Art Unit: 1774
Tukaram K. Hatwar, et al	Examiner: Dawn L. Garrett
A STABILIZED WHITE-LIGHT-EMITTING OLED DEVICE	I hereby certify that this correspondence is being deposited today with the United States Postal Service as first class mail in an envelope addressed to Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
Serial No. 10/690,940	Deborah Walczak Deborah Walczak
Filed October 22, 2003	March 9, 2006 Date

Mail Stop APPEAL BRIEF-PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA. 22313-1450

Sir:

APPEAL BRIEF TRANSMITTAL

Enclosed herewith is Appellants' Appeal Brief for the above-identified application.

The Commissioner is hereby authorized to charge the Appeal Brief filing fee to Eastman Kodak Company Deposit Account 05-0225. A duplicate copy of this letter is enclosed.

Respectfully submitted,

Attorney for Appellants
Registration No. 22,363

Raymond L. Owens/djw
Telephone: 585-477-4653
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Enclosures

If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.

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Alexandria, VA. 22313-1450

APPEAL BRIEF PURSUANT TO 37 C.F.R. 41.37 and 35 U.S.C. 134

Sir:

Appellants hereby appeal to the Board of Patent Appeals and Interferences from the Examiner's Final Rejection of claims 1-8, 13 and 17-20 which was contained in the Office Action mailed August 24, 2005. A timely Notice of Appeal was filed on December 16, 2005. This appeal brief is being filed in accordance with the provisions of 37 C.F.R. § 41.37. The Commissioner is authorized to charge the fee of $500.00 under Rule 17(c) for filing of this brief to Deposit Account 05-0225. If this fee is deemed to be insufficient, authorization is hereby given to charge any deficiency (or credit any balance) to deposit account 05-0225. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136(a) and authorizes payment of any such extensions fees to Deposit Account No. 05-0225.

03/14/2006 YPOLITE1 00000077 050225 10690940
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Adjustment date: 03/15/2006 EEKUBAY1
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TABLE OF CONTENTS

1. REAL PARTY IN INTEREST

The real party in interest in this application is Eastman Kodak Company, as evidenced by an assignment filed in the United States Patent and Trademark Office.

2. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to appellant, the appellant's legal representative, or the assignee which are related to, will directly affect or be directly affected by, or have a bearing on the Board's decision in the pending appeal.

3. STATUS OF CLAIMS

Pending claims: 1-20

Claims objected to: 9-12 and 14-16

Rejected claims: 1-8, 13 and 17-20

Appealed claims: 1-8, 13 and 17-20

Appendix I provides a clean, double spaced copy of the claims on appeal.

4. STATUS OF AMENDMENTS

No amendment was filed after final rejection, and all amendments have been entered into the record.

5. BACKGROUND OF THE INVENTION AND SUMMARY OF CLAIMED SUBJECT MATTER

An OLED device includes a substrate, an anode, an organic luminescent layer, and a cathode. An OLED device often includes a substrate, an anode, a hole-transporting layer made of an organic compound, an organic luminescent layer with suitable dopants, an organic electron-transporting layer, and a cathode. OLED devices are attractive because of their low driving voltage, high luminance, wide-angle viewing, and capability for full-color flat emission displays. Tang *et al.* described this multilayer OLED device in their U.S. Patents 4,769,292 and 4,885,211.[1]

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[1] Specification at page 1, lines 16-23.

Efficient white light producing OLED devices are considered a low cost alternative for several applications such as paper-thin light sources, backlights in LCD displays, automotive dome lights, and office lighting. White light producing OLED devices should be bright, efficient, and generally have Commission International d'Eclairage (CIE) chromaticity coordinates of about (0.33, 0.33). In any event, in accordance with this disclosure, white light is that light which is perceived by a user as having a white color.[2]

White light producing OLED devices have been reported before by J. Shi (U.S. Patent 5,683,823) wherein the luminescent layer includes red and blue light-emitting materials uniformly dispersed in a host emitting material. This device has good electroluminescent characteristics, but the concentration of the red and blue dopants are very small, such as 0.12% and 0.25% of the host material. These concentrations are difficult to control during large-scale manufacturing. Sato *et al.* in JP 07,142,169 discloses an OLED device, capable of emitting white light, made by forming a blue light-emitting layer next to the hole-transporting layer and followed by a green light-emitting layer having a region containing a red fluorescent layer.[3]

Kido *et al.*, in Science, Vol. 267, p. 1332 (1995) and in *Applied Physics Letters* Vol. 64, p. 815 (1994), report a white light producing OLED device. In this device three emitter layers with different carrier transport properties, each emitting blue, green or red light, are used to generate white light. Littman et al. in U.S. Patent 5,405,709 disclose another white emitting device, which is capable of emitting white light in response to hole-electron recombination, and comprises a fluorescent in a visible light range from bluish green to red. Recently, Deshpande *et al.*, in *Applied Physics Letters*, Vol. 75, p. 888 (1999), published a white OLED device using red, blue, and green luminescent layers separated by a hole blocking layer.[4]

However, these OLED devices require a very small amount of dopant concentrations, making the process difficult to control for large-scale manufacturing. Also, emission color varies due to small changes in the dopant concentration. White OLEDs are used making full-color devices using a color filter array. An example of a

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[2] Specification at page 1, lines 24-30
[3] Specification at page 2, lines 5-14.
[4] Specification at page 2, lines 15-24.

white color filter array top emitting device is shown in U.S. Patent 6,392,340. However, the color filter transmits only about 30% of the original light. Therefore, high luminance efficiency and stability are required for the white OLEDs.[5]

The present invention provides a stabilized white-emitting OLED device with improved lifetime, which comprises:

a) an anode;

b) a cathode;

c) a light-emitting layer disposed between the anode and the cathode; and

d) a stabilizing substituted perylene material having a concentration selected so that it does not emit light to thereby increase the lifetime of the white-light-emitting OLED device.[6]

Perylene or its derivatives can be provided in one or more of the organic layers of an OLED white-light-emitting device in a sufficient amount to stabilize the OLED device and improve its lifetime.[7]

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following issues are presented for review by the Board of Patent Appeals and Interferences:

A. The rejection of claims 1-4 under 35 U.S.C. 112, first paragraph, for failure to comply with the written description requirement.

B. The rejection of claims 1, 5, 13 and 17-19 under 35 USC 103(a) based on Codama (US 6,091,196).

C. The rejection of claims 2-4, 6-8 and 20 under Section 103(a) based on Codama in view of Toguchi *et al.* (US 6,753,097).

[5] Specification at page 2, line 25 to page 3, line 2.
[6] See claim 1.
[7] Specification at page 3, lines 15-18.

7. ARGUMENT

A. Claims 1-4 comply with the written description requirement of 35 USC 112, first paragraph.

i. The examiner's stated case.

Claims 1-4 are rejected under the first paragraph of Section 112 as failing to comply with the written description requirement. The examiner urges that the claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors had possession of the claimed invention at the time of filing. She notes that the phrase "at least two" is considered to be new matter (although she does not cite Section 132 of the statute), and comments that "it is not seen where the specification provides for an unlimited number of light-emitting layers, which the claim language 'at least two' would include" (emphasis in original).

ii. Claim recitations must be read in the context of the level of knowledge in the relevant art.

A claim reciting "at least two" light-emitting layers must be read in the context of the level of knowledge in the relevant art in order to determine whether it conveys to one skilled in that art that the inventors had possession of the claimed invention at the time of filing. It cannot be read in a vacuum. Commonly, white-light emitting OLED devices include three layers. See, for example, appended online excerpts described white-light emitting devices with three emission layers.[8] The present specification, on the other hand, also provides examples in which two layers are used to produce a white-light emitting OLED. Taken in the context of the level of knowledge in the relevant art, the claim fully conveys possession of the presently-claimed scope of the invention, in which there are at least two light-emitting layers in a white light emitting device. That person of knowledge in the art would not comprehend a device with an unlimited number of layers, as alleged.

[8] These excerpts were forwarded with the response dated November 23, 2005.

B. Claims 1, 5, 13 and 17-19 are rejected under 35 USC 103(a) based on Codama (US 6,091,196).

i. The examiner's stated case.

The examiner maintains that "Codama generally teaches that perylene derivatives are materials that may be used as the fluorescent substance of the device...Codama is deemed to teach fluorescent material in the light emitting layer within the range disclosed by applicant" (citing col. 16, lines 38-41 of Codama).

ii. The claims clearly distinguish over any reference which teaches the use of perylene derivatives as the ***fluorescent*** substance

It is true that Codama teaches that "perylene derivatives are materials that may be used as the ***fluorescent substance of the device,***" just as the examiner states. However, the present claims do not use perylene derivatives as the "fluorescent substance." To the contrary, the present claims clearly recite "a stabilizing substituted perylene material ***having a concentration selected so that it does not emit light*** to thereby increase the lifetime of the white-light-emitting OLED device." The claims thus clearly distinguish over any reference which teaches the use of perylene derivatives as the ***fluorescent*** substance.

The examiner cites column 16 of Codama as disclosing "fluorescent material in the light emitting layer within the range disclosed by applicant." However, the cited portion of Codama relates to the amount of rubrene, a different yellow-emitting dopant, in an emissive layer. The amount of dopant that must be added to a layer in order for that layer to emit light differs for ***each*** compound. Therefore, it is improper to assert that a teaching of the amount of rubrene to be added to a layer in order to make that layer emit light "teaches" the amount of a perylene derivative that must be added in order to make a layer produce light. Indeed, applicant's specification notes that "it is necessary that the level of dibenzoperylene concentration be selected so that the dibenzoperylene is ***a non-luminescent dopant.*** The level at which this occurs will ***vary*** depending on the properties of the layer" (paragraph bridging pages 27 and 28). For example, for the particular compound used in examples 1-6, amounts of less than 5% must be used to prevent luminescence. By contrast, for the compound in examples 13-18, it is reported that higher amounts can be used, up to 10%. This confirms that the amount of a

substance necessary for luminescence is dependent on the particular compound, and negates the value of Codama's teaching with respect to what amount of rubrene will produce a light-emitting layer. Thus, Codama does not teach an amount of a perylene derivative "within the range disclosed by applicant," because applicant's range recites an amount that ***"does not emit light,"*** whereas Codama teaches perylene as the fluorescent substance of a device. There would have been no motivation to modify Codama to use an amount of perylene that does not emit light, and therefore no *prima facie* case of obviousness exists.

iii. The doctrine of unappreciated features or results is not applicable in the present case.

During an interview on November 15, 2005, Examiner Garrett questioned whether applicant was attempting to distinguish their product claims over the art by asserting an unappreciated result of perylene derivatives. The issue in the present case is one of obviousness, not anticipation. Consideration of an inherent quality is relevant only to anticipation, not obviousness. *Jones v. Hardy,* 230 USPQ 1021, 1025 (Fed. Cir. 1984). *Jones* dealt with the issue of whether the discovery of a use of an inherent quality of a product well known in the art was unpatentable because of obviousness. The claims at issue were directed to a polystyrene mold having a pattern of artistic relief and a method of constructing a concrete wall using the mold. In the prior art, polystyrene was used for simple molds while other materials were used for making designs. The other materials used for designs presented problems of releasability. Since the claims were directed to molds with designs, there was no anticipation. The court found that the property of releasability that was inherent in the prior art use of polystyrene in simple molds was not relevant to a determination of obviousness. In finding the invention nonobvious, the court noted that consideration must be given to the invention as a whole, not the "degree of inventiveness."

Similarly, the claims here are directed to amounts of perylene derivatives in "a concentration selected so that it ***does not emit light***," as opposed to amounts of perylene derivatives that will serve as the fluorescent substance in a layer (*cf.* molds with designs as opposed to molds without designs in *Jones*). The claims thus are not anticipated by prior art disclosures, such as Codama, which discloses perylene derivatives used as the ***luminescent*** material in a layer, *i.e.*, in a concentration selected so that it ***does emit light***.

The doctrine of unappreciated features or results only comes into play if the amount of perylene derivative is such that it is anticipated by the prior art. In that case, applicant would be seeking to patent a product that has already been ``disclosed. That is not the case here.

C. Claims 2-4, 6-8 and 20 are rejected under Section 103(a) based on Codama in view of Toguchi et al. (US 6,753,097).

i. The examiner's stated case.

The examiner relies upon Codama as described above, *i.e.*, she alleges that "Codama generally teaches that perylene derivatives are materials that may be used as the fluorescent substance of the device...Codama is deemed to teach fluorescent material in the light emitting layer within the range disclosed by applicant" (citing col. 16, lines 38-41 of Codama). She cites Toguchi *et al.* for its teaching of the specific perylene derivatives recited in claims 2-4, 6-8 and 20.

ii. The addition of Toguchi to Codama does not overcome the failure of Codama to teach the more basic features of the invention.

Toguchi does not overcome the failure of Codama to suggest amounts of perylene derivatives that do not emit light. The combination of Codama and Toguchi therefore does not undermine the arguments presented above. Claims 2-4, 6-8 and 20 are patentable for the same reasons presented above for claims 1, 5, 13 and 17-19.

8. CONCLUSION

For the above reasons, Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the rejection by the Examiner and mandate the allowance of Claims 1-8, 13 and 17-20.

Respectfully submitted,

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If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.

APPENDIX I. CLAIMS ON APPEAL

1. A stabilized white-light-emitting OLED device, comprising:

a) an anode;

b) a cathode;

c) at least two light-emitting layers disposed between the anode and the cathode; and

d) a stabilizing substituted perylene material having a concentration selected so that it does not emit light to thereby increase the lifetime of the white-light-emitting OLED device.

2. The stabilized white-light-emitting OLED device of claim 1 wherein the perylene material is a substituted or unsubstituted benzoperylene.

3. The stabilized white-light-emitting OLED device of claim 1 wherein the perylene material is a substituted or unsubstituted dibenzoperylene.

4. The stabilized white-light-emitting OLED device of claim 1 wherein the perylene material is a substituted or unsubstituted tribenzoperylene.

5. A stabilized white-light-emitting OLED device, comprising:

a) an anode and a cathode spaced apart from the anode;

b) a hole-transporting layer disposed over the anode;

c) a yellow-light-emitting layer and a blue-light-emitting layer disposed between the hole transporting layer and the cathode; and

d) a stabilizing substituted perylene material disposed at least in one of the following layers: the hole-transporting layer; the blue-light-emitting layer; or the yellow-light-emitting layer and having a concentration selected so that it does not emit light to thereby increase the lifetime of the white-light-emitting OLED device.

6. The stabilized white-light-emitting OLED device of claim 5 wherein the substituted perylene material is a substituted or unsubstituted benzoperylene.

7. The stabilized white-light-emitting OLED device of claim 5 wherein the substituted perylene material is a substituted or unsubstituted dibenzoperylene.

8. The stabilized white-light-emitting OLED device of claim 5 wherein the substituted perylene material is a substituted or unsubstituted tribenzoperylene.

13. A stabilized white-light-emitting OLED device, comprising:

a) an anode and a cathode spaced apart from the anode;

b) a hole-transporting layer disposed over the anode;

c) a yellow-light-emitting layer and a blue-light-emitting layer disposed between the hole transporting layer and the cathode;

d) an electron-transporting layer adjacent to the cathode and either the yellow-light-emitting layer or the blue-light-emitting layer; and

e) a stabilizing substituted perylene material disposed at least in one of the following layers: the hole-transporting layer, the blue-light-emitting layer, the yellow-light-emitting layer, or the electron-transporting layer and having a concentration selected so that it does not emit light to thereby increase the lifetime of the white-light-emitting OLED device.

17. The stabilized white-light-emitting OLED device of claim 13 wherein the yellow-light-emitting layer is in contact with the hole-transporting layer.

18. The stabilized white-light-emitting OLED device of claim 13 wherein the blue-light-emitting layer is in contact with the hole-transporting layer.

19. The stabilized white-light-emitting OLED device of claim 13 wherein the level of substituted perylene material concentration in one or more layers is selected so that the substituted perylene material is a non-luminescent dopant.

20. The stabilized white-light-emitting OLED device of claim 13 wherein the sustituted perylene material is dibenzo[*b*,*k*]perylene.

APPENDIX III. RELATED PROCEEDINGS APPENDIX

There are no related appeals or interferences known to appellant, the appellant's legal representative, or the assignee which are related to, will directly affect or be directly affected by, or have a bearing on the Board's decision in the pending appeal.

APPENDIX III. EVIDENCE APPENDIX

Copies of literature evidence submitted with the response dated November 23, 2005 in connection with the response to the rejection under 35 USC 112, first paragraph, are provided.

the electron transport and hole transport layer. In white-color emitting devices there may be three separate emission layers, each emitting a different color. So today's devices may have a total of 7 - 9 layers - including electrodes, deposited by different techniques (sputtering, vapor deposition, solvent coating, etc). In spite of the large number of layers the total thickness of the device is typically less than 100 - 200 nm.

The deposition of all layers requires humidity- and oxygen-free conditions and all will require class 10 clean room. The cost consequence of such complexity is high. The deposition of each layer negatively impacts the manufacturing yield of the final device. The number of layers depends primarily on the type of materials used. It is still not clear how many layers will be ultimately needed to achieve the best performance.

Polymeric OLED devices

Polymeric OLED devices have usually fewer layers. The electroactive polymers may serve multiple functions: both electron and hole transport and light emission, even though dopant emitters can be used to tune the color. The electron transporting polymer and hole transporting polymer may be in one or two separate layers. In some cases, very thin layers of p-doped and n-doped semi-conducting polymers are sandwiched between the transport polymers and the cathode and anode, respectively, to facilitate charge injection. The active polymers and the injection layers are solution-coatable, but the electrodes are deposited by different techniques such as vapor deposition or ion sputtering, as in "small molecular" devices. To date, a large number of polymers have been synthesized and tested, and new structures are still emerging. The polymers have an extended chain of conjugated double bonds or aromatic rings, and pendant groups, which determine the emission characteristics. The polymers are members of the polyphenylene vinylene family, polyfluorene homo- and copolymers and a new class of poly-spiro emitters *(13)*.

"Small Molecular" OLED Devices

As the name indicates, the active components are "small" molecules. These small molecules are deposited by vapor deposition. Most "small molecules" would crystallize when deposited from solutions and crystallization would damage the device performance. Also, solution coating may result in uncontrollable mixing of layers. Most of the hole-transport small molecules contain one or several aromatic amine groups (a key pre-requisite for hole transport) and a variety of pendant substituents. These molecules have a low oxidation potential and must form stable cation-radicals.

Electron transport molecules are typically complexes of a metal such as aluminum (such as Alq_3), boron, etc. with aromatic groups, bis-biphenyl anthracene, or, recently developed silacyclo-pentadienes *(14, 15)*. These molecules have a relatively high electron affinity and must form stable anion-radicals. Some silacyclo-pentadiene may be unstable but new structures are being synthesized. The detailed description of the structures of charge transport materials is beyond the scope of this overview.

Also, there is a need to fabricate the devices with extremely uniform thicknesses of each layer. Nonuniformities may lead to localized surges of electric current, localized overheating, and gradual destruction of the device. The complexity makes the fabrication of OLEDs difficult and slows down testing of new materials.

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ORGANIC WHITE LIGHT EMITTING DEVICES WITH AN RGB STACKED MULTILAYER STRUCTURE

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Abstract:

White organic light emitting devices (OLEDs) with an RGB stacked multilayer structure are demonstrated. In RGB staked OLEDs, blue emitting 1,4-bis[2,2-diphenylvinyl]biphenyl (DPVBi), green emitting quinacridone (QD), and red emitting [2,6-bis[2-[5-(dibutylamino)phenyl] vinyl]-4H-pyran-4-ylidene]propanedinitrile (DADB) were used. Through the optimization of the device structure, the pure white light emission with CIE coordinates of (0.33,0.33) at 20 mA/cm^2 was obtained, at which the color temperature and color rendering index were 5560 K and 79, respectively. Its maximum luminance was 14,000 cd/m^2 at 12.6 V, and the luminance efficiency was 1.34 lm/W at 100 cd/m^2.

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Small Molecule

The earliest OLEDs work was done at **Eastman Kodak labs** by Ching Wan Tang and Steven Van Slyke.; and almost all OLED patents issued since refer to them. In 1982 they obtained electroluminescence from (hydroxyquinoline aluminum) AlQ3. The early simple 2 layer device gave a luminance of 1000 cd/m2 at 10 Vs. Later the display was improved greatly by doping the emitter layer with small amounts of fluorescent laser dyes, and used to change colors. For white light, more emission layers were added, each specifically (color) dyed (the shades determined by the thickness of the layer,) a first step toward hi-efficiency devices.

"Doping the emissive layer with highly fluorescent molecules...is critical for producing color OLEDs," says a Kodak paper. (In an experiment to test toxicity - a hot topic for dyes – Arthur Schalow, one of the laser inventors, injected fluorescein dye in jello, which he lased, and then ate -living for many more years.)

Kodak sells the indispensable organic supplies to its licensees (red, green, blue emitters, NPB- a hole transport material, Alq – the electron transport and hole injection layer, dyes and laser dyes.)

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